

### **Amendments to the Claims**

1. (*Currently Amended*) Method for transferring chips (42) from a wafer (44) to a lead frame (50), the method comprising the steps of:

- [[ - ]] positioning a wafer (44) with chips surfaces extending in a first plane (2);
- [[ - ]] positioning a lead frame (50) with a bond surface thereof extending in a second plane (4) which is at a first angle ( $\alpha$ ) of between 0° and 180° to the first plane (2), the first plane and the second plane intersecting at an intersection line (8);
- [[ - ]] providing a rotatable transfer assembly (12, 16, 18; 32) with at least two transfer heads (14; 40a, 40b, 40c, 40d), the transfer assembly having an axis of rotation (10a, 10b, 10c) which extends in a third plane (6) at half of the first angle ( $\alpha$ ) to the first plane (2) and the second plane (4), respectively, the axis of rotation extending at a second angle ( $\beta$ ) of at least 0° and at most 90° to said intersection line (8);
- [[ - ]] picking up a first chip (42) from the wafer (44) by one of the transfer heads (14; 40a-40d) in a chip pick-up position, while bonding a second chip to the lead frame (50) by another one of the transfer heads in a chip bonding position;
- [[ - ]] transferring the first chip (42) by said one of the transfer heads from the chip pick-up position to the chip bonding position; and
- [[ - ]] bonding the first chip (42) on the lead frame (50) by said one of the transfer heads (14; 40a-40d) in the chip bonding position, while picking up a third chip from the wafer (44) by another one of the transfer heads in the chip pick-up position.

2. (*Currently Amended*) Method according to claim 1, characterized in that the transfer heads (14; 40a-40d) are rotatable essentially along one circle (20) in a fourth plane at right angles to the axis of rotation (10a-10c) of the transfer assembly (32).

3. (*Currently Amended*) Method according to claim 2, characterized in that the transfer heads (14; 40a-40d) are spaced regularly along said circle (20).

4. (*Currently Amended*) Method ~~according to any of claims 1-3;~~ according to claim 1, characterized in that the first angle ( $\alpha$ ) is 90°.

5. (*Currently Amended*) Method ~~according to any of claims 1-4;~~ according to claim 1, characterized in that the second angle ( $\beta$ ) is 0°.

6. (*Currently Amended*) Method ~~according to any of claims 1-5;~~ according to claim 1, characterized in that the number of transfer heads (14; 40a-40d) is four.

7. (*Currently Amended*) Method ~~according to any of claims 1-6;~~ according to claim 1, characterized in that the transfer assembly (12, 16, 18) is rotated in one direction.

8. (*Currently Amended*) Apparatus for transferring chips (42) from a wafer to a lead frame, comprising:

[[ - ]] a wafer-positioning device for positioning a wafer (44) with chips surfaces thereof extending in a first plane (2);

[[ - ]] a lead frame positioning device for positioning a lead frame (50) with a bond surface thereof extending in a second plane (4) which is at a first angle ( $\alpha$ ) of between 0° and 180° to the first plane (2), the first plane and the second plane intersecting at an intersection line (8);

[[ - ]] at least one rotatable transfer assembly (12, 16, 18; 32) comprising at least two transfer heads (14; 40a, 40b, 40c, 40d) for picking up a first chip (42) from the wafer (44) by one of the transfer heads in a chip pick-up position, while bonding a second chip to the lead frame (50) by another one of the transfer heads in a chip bonding position; transferring the first chip by said one of the transfer heads from the chip pick-up position to the chip bonding position; and bonding the first chip on the lead frame by said one of the transfer heads in the chip bonding position, while picking up a third chip from the wafer by another one of the transfer heads in the chip pick-up position,

[[ - ]] a transfer assembly motor for driving the rotatable transfer assembly about an axis of rotation (10a, 10b, 10c) which extends in a third plane (6) at half of first angle ( $\alpha$ ) to

the first plane ~~(2)~~ and the second plane (4), respectively, and the axis of rotation extending at a second angle ( $\beta$ ) of at least  $0^\circ$  and at most  $90^\circ$  to said intersection line ~~(8)~~.

9. (*Currently Amended*) Apparatus according to claim 8, characterized in that the transfer heads ~~(14; 40a-40d)~~ are rotatable essentially along one circle (20) in a fourth plane at right angles to the axis of rotation ~~(10a-10e)~~ of the transfer assembly ~~(32)~~.

10. (*Currently Amended*) Apparatus according to claim 9, characterized in that the transfer heads ~~(14; 40a-40d)~~ are spaced regularly along said circle (20).

11. (*Currently Amended*) Apparatus ~~according to any of claims 8-10,~~ according to claim 8, characterized in that the first angle ( $\alpha$ ) is  $90^\circ$ .

12. (*Currently Amended*) Apparatus ~~according to any of claims 8-11,~~ according to claim 8, characterized in that the second angle ( $\beta$ ) is  $0^\circ$ .

13. (*Currently Amended*) Apparatus ~~according to any of claims 8-12,~~ according to claim 8, characterized in that the number of transfer heads ~~(14; 40a-40d)~~ is four.

14. (*Currently Amended*) Apparatus ~~according to any of claims 8-13,~~ according to claim 8, characterized in that the transfer assembly ~~(12, 16, 18)~~ is rotated in one direction.

15. (*Currently Amended*) Apparatus according to claim 8, characterized in that each transfer head ~~(14; 40a-40d)~~ comprises a collet ~~(66a-66d)~~ which, in the chip pick-up position, is movable in a direction essentially at right angles to the first plane ~~(2)~~, and in the chip bonding position, is movable in a direction essentially at right angles to the second plane (4).

16. (*Currently Amended*) Apparatus according claim 15, characterized in that the transfer assembly ~~(32)~~ comprises a counterweight for each collet ~~(66a-66d)~~, each collet being coupled to its corresponding counterweight through a mechanical coupling for

compensating radial forces exerted on the collet relative to said axis of rotation (~~10a, 10b, 10e~~).

17. (*Currently Amended*) Apparatus according to claim 16, characterized in that the mechanical coupling is adapted to be driven by a collet drive motor (~~79, 83~~) for moving the collet (~~66a-66d~~) radially relative to said axis of rotation (~~10a, 10b, 10e~~).

18. (*Currently Amended*) Apparatus according to claim 17, characterized in that the transfer assembly motor has the same axis of rotation (~~10a-10e~~) as the collet drive motor (~~79, 83~~).

19. (*Currently Amended*) Apparatus ~~according to any of claims 16-18~~, according to claim 16, characterized in that the counterweight for one collet (~~66a-66d~~) is another collet of the transfer assembly (~~32~~).

20. (*Currently Amended*) Apparatus according to claim 19, characterized in that said one collet (~~66a-66d~~) is situated oppositely relative to said other collet with respect to said axis of rotation (~~10a, 10b, 10e~~).

21. (*Currently Amended*) Apparatus ~~according to any of claims 16-20~~, according to claim 16, characterized in that the mechanical coupling is a wire (~~72, 74~~).

22. (*Currently Amended*) Apparatus according to claim 21, characterized in that a support (~~68a-68d~~) of each collet (~~66a-66d~~) relative to the transfer assembly (~~32~~) comprises a pressure spring (~~70a-70d~~) pretensioning the wire (~~72, 74~~).

23. (*Currently Amended*) Apparatus according to claim 22, characterized in that the pressure spring (~~70a-70d~~) has a low stiffness.

24. (*Currently Amended*) Apparatus according to claim 22, characterized in that the pretension force is greater than a bonding force to be applied on a chip (42) on a lead frame (50) by the collet (~~66a-66d~~) of a transfer head (~~14; 40a-40d~~).

25. (*Currently Amended*) Apparatus according to claim 8, characterized in that the rotatable transfer assembly (32) is rotatable around a transfer assembly stator (100), a narrow circumferential gap (104) being provided between the rotatable transfer assembly (32) and the transfer assembly stator (100), the transfer assembly stator (100) comprising groove sections (106) facing the gap (104) for at least the chip pick-up position and the chip bonding position, respectively, each groove section (106) extending in the circumferential direction and being in communication with a first gas duct (~~108; 116a-116d; 118a-118d; 120a-120d; 122a-122d~~), each transfer head of the rotatable transfer assembly (32) comprising at least one collet having a pick-up opening, the pick-up opening being in communication with the gap (104) through a second gas duct (124).

26. (*Currently Amended*) Apparatus according to claim 25, characterized in that the number of groove sections (106) is equal to the number of transfer heads.

27. (*Currently Amended*) Apparatus according to ~~claim 25 or 26~~, according to claim 25, characterized in that each first duct (~~108; 116a-116d; 118a-118d; 120a-120d; 122a-122d~~) is provided with a controllable valve (~~116e-116g; 118e-118g; 120e-120g; 122e-122g~~).

28. (*Currently Amended*) Apparatus according to ~~claim 25 or 27~~, according to claim 25, characterized in that the second gas duct (124) at its end facing the gap (104) is provided with a bridging groove (126) extending in the circumferential direction, the bridging groove (126) being adapted to bridge two adjacent groove sections (106) of the transfer assembly stator (100).

29. (*Currently Amended*) Method according to claim 1, characterized in that the picking up a chip (214) in the chip pick-up position comprises the steps of:

[[ -]] (a) positioning a vacuum head (~~222~~) holding a carrier film (~~220~~) carrying the chip (~~214~~), the vacuum head (~~222~~) comprising a needle (~~224~~) for pushing the chip (~~214~~) away from the carrier film (~~220~~);

[[ -]] (b) positioning a collet (~~208~~) opposite to the chip (~~214~~);

[[ -]] (c) pushing the chip (~~214~~) by the needle (~~224~~) from the carrier film (~~220~~) against the collet (~~208~~); and

[[ -]] (d) moving the needle (~~224~~) away from the chip (~~214~~).

30. (*Currently Amended*) Method according to claim 29, characterized in that during step (d) the vacuum head (~~222~~) is moved away from the chip (~~214~~).